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A MONTHLY EFFECT IN STOCK RETURNS

Robert A. Ariel
Sloan School of Management
Massachusetts Institute of Technology

Working Paper #1629-84 Revised: March 1984

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY
50 MEMORIAL DRIVE
CAMBRIDGE, MASSACHUSETTS 02139

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Department of Finance
Sloan School of Management
Massachusetts Institute of Technology
50 Memorial Drive
Cambridge, MA 02139

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ABSTRACT

The mean return for stocks is positive only for days immediately before and during the first half of calendar months, and indistinguishable from zero for days during the last half of the month. During the 1963-1981 period all of the market's cumulative advance occurred just before and during the first half of months, with the last half contributing nothing to the cumulative increase. This "monthly effect" is independent of other known calendar anomalies such as the January effect (Roll, 1983; Keim, 1983) and appears to be caused by a shift in the mean of the distribution of returns from days in the first half of the month relative to days in the last half.

1. Introduction

This paper documents a curious anomaly in the monthly pattern of stock index returns: stocks exhibit positive average returns only around the beginning and during the first half of calendar months, and show zero returns during the second half. During the nineteen year span studied, all of the market's cumulative advance occurred around the first half of the month, the second half contributing nothing to the cumulative increase. The effect of the anomaly on stock returns is by no means subtle; its impact is of the same order of magnitude as the well-known weekend effect documented by French (1980) and Gibbons and Hess (1981).

Several other studies report anomalous calendar dependencies in stock returns. First as noted above, a weekend effect has been identified in stock returns, the most salient characteristic of which is low or negative returns on Mondays. The below-average Monday return does not appear to be due solely to the market's weekend closing (i.e., it is not a "closed market effect") since returns from days following mid-week holiday closings are not unusually low. Hence the "weekend effect" does not seem to be a pure "closed market effect," but instead to be a "calendar effect," that is, an effect dependent on the weekly unit itself.[1]

Second, a January Effect in stock returns has been noted by Keim (1983) and Roll (1983). This effect is characterized by high stock returns on the last trading day of December and during the first few weeks of the subsequent January, with especially high returns accruing to small capitalization firms. Relief of tax-loss selling pressure in January has been advanced as the cause of the January effect, but the

persistance of this phenomenon in some overseas markets with non-January tax year starting dates (Brown, Keim, Kleidon and Marsh, 1983; Gultiken and Gultiken, 1983) suggests that the January effect may be in part an effect induced by the turn of the year, a "Calendar effect."

Third, a number of stock market advisors claim that a monthly pattern exists.[2] These advisors urge their clients to make anticipated purchases before the start of calendar months, and to postpone planned sales until after the middle of the month to capture the unusually high returns that accrue in the early days of calendar months.

In section 2, a variety of tests to determine if the returns accruing to stock indexes are drawn from a single distribution on each day of the month are reported. These tests show the existence of a monthly pattern in the returns earned by stocks. In section 3, the results are discussed, and possible biases that might induce the observed effect are considered.

2. Test Results

The tests to be reported employ the Center for Research in Security Prices (CRSP) value-weighted and equally-weighted stock index returns to represent the returns accruing to "stocks." The data span the years 1963 through 1981.

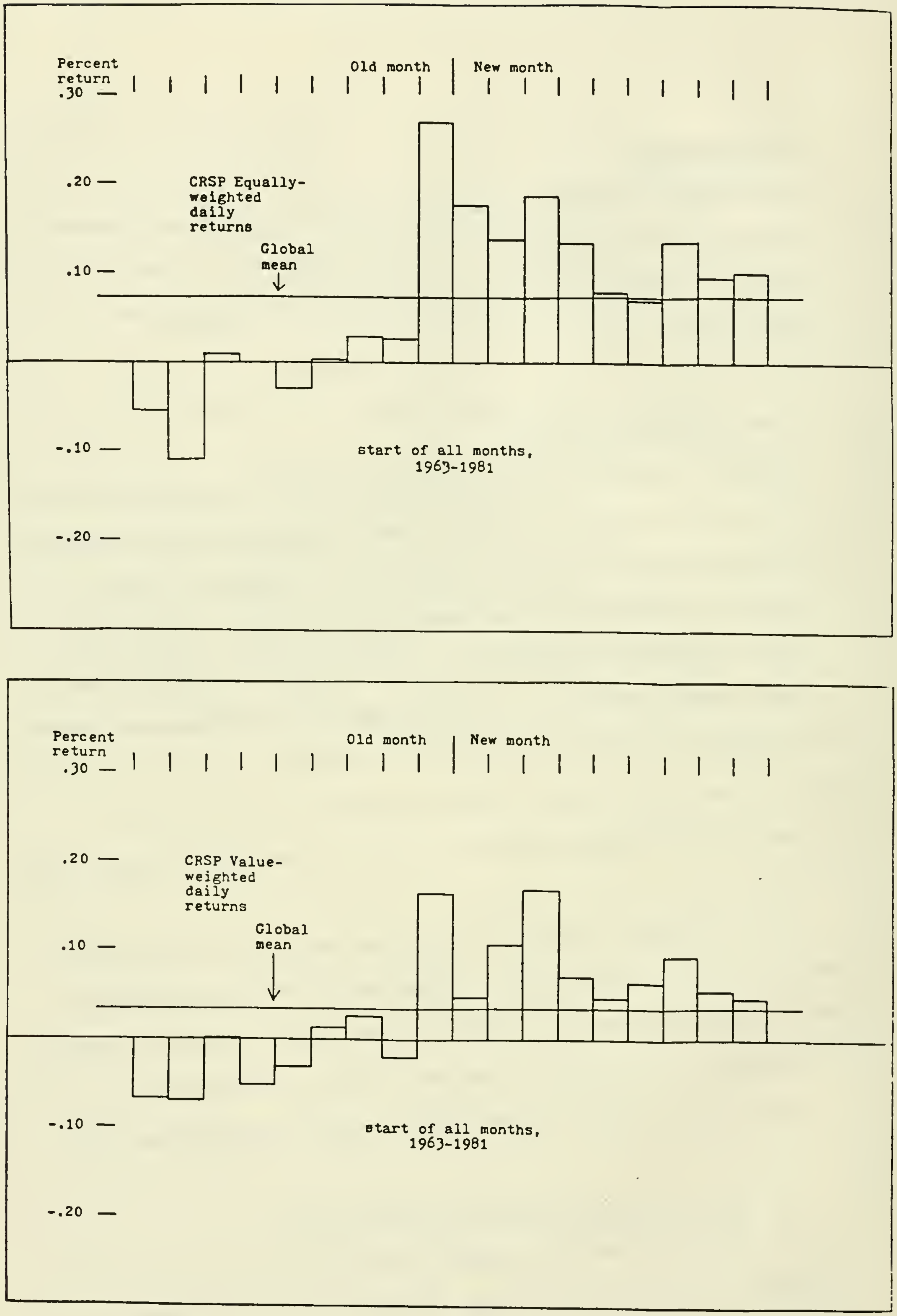
2.1 The Monthly Pattern

Figure 1 presents histograms of the arithmetic mean returns for the days surrounding the start of each month for both the CRSP value-weighted and equally-weighted indices. (A table of the numerical results is presented in appendix 1.) Mean returns for days 1,2...9 and days -1,-2...-9 are plotted where day 1 is the first trading day of each calendar month, and day -1 is the last day of the previous month. Any days that do not fall in this interval are ignored. Since daily observations span the years 1963 through 1981, each daily mean is estimated from 228 daily observations (i.e., nineteen years times twelve months).

The resulting histograms show positive returns at the beginning of the month, starting on the last trading day of the previous month and continuing through the first half of the new month, followed by negative returns after the mid-point of the month. Four of the days (days -9, -8, -1, and +3) differ from the global mean at the .05 significance level.

2.2 Mean Daily Returns in the Halves of Months

The substantial variation present in daily stock index data renders it difficult to extract significant results from the 228 observations on



Percent return
.30
.20
.10
-.10
-.20
Old month
New month
CRSP Equally-weighted daily returns
Global mean
start of all months, 1963-1981
Percent return
.30
.20
.10
-.10
-.20
Old month
New month
CRSP Value-weighted daily returns
Global mean
start of all months, 1963-1981

Figure 1

each day of the month. This problem can be overcome by aggregating a number of days of the month.

Define a "trading month" to extend from the last trading day (inclusive) of each calendar month to the last trading day (exclusive) of the following calendar month (i.e., the last trading day of each calendar month is included with the following month). The null hypothesis to be tested is:

H: The returns accruing to days in the first half of each trading month are the same as returns accruing to days in the second half.

The alternate hypothesis is that the daily returns in the two halves of trading months are not equal.

The null hypothesis can be tested by estimating the following model:

$$R_t = A + B \times D_t + e_t \qquad (1)$$

where R_t are the daily stock index returns and D_t are dummies which assume a value of one during the first ten trading days of each trading month, and zero on all other days.[3]

Daily stock index returns are strongly autocorrelated, perhaps because of non-trading and non-synchronous trading effects, and accordingly the error term in the above model will also be autocorrelated. Hence the model to be estimated must be rewritten in first-difference form so that the error term will be serially independent:

$$R_t - \rho \times R_{t-1} = A \times (1 - \rho) + B \times (D_t - \rho \times D_{t-1}) + e_t \quad . \qquad (2)$$

Since the temporal properties of the R_t and e_t would be expected to be similar for a regression with a very low expected R^2, ρ was chosen equal to the serial correlation coefficient of the R_t during

Table 1

Results of the regression of CRSP daily index returns, R_t, on a dummy variable, D_t, representing the ten trading days starting on the last trading day of calendar months. The model is written in first-difference form to correct for the strong serial dependence in the residuals, where ρ is the observed first-order serial correlation coefficient of the R_t during the regression period.

$$R_t - \rho R_{t-1} = A(1 - \rho) + B(D_t - \rho D_{t-1}) + e_t \tag{2}$$

Period (Daily observations)	Intercept, A, in percent (t-statistic)	Dummy, B, in percent (t-statistic)	ρ	R2	F
	Equally-Weighted Index				
1963-1981 (4767)	.00142 (.00641)	.150 (5.18)	.399	.0056	26.80
1963-1966 (1009)	.000421 (.00136)	.152 (3.65)	.341	.0131	13.36
1967-1971 (1234)	.0119 (.241)	.125 (1.98)	.418	.0032	3.91
1972-1976 (1262)	-.00357 (-.692)	.177 (2.74)	.469	.0059	7.49
1977-1981 (1262)	.0199 (.511)	.155 (2.91)	.313	.0067	8.48
	Value-Weighted Index				
1963-1981 (4767)	-.0154 (-.803)	.130 (3.90)	.260	.0032	15.18
1963-1966 (1009)	-.0212 (-.888)	.127 (3.44)	.184	.0116	11.81
1967-1971 (1234)	-.0026 (.069)	.0704 (1.42)	.332	.0016	2.01
1972-1976 (1262)	-.0244 (-.529)	.0936 (1.47)	.276	.0017	2.16
1977-1981 (1262)	-.0181 (-.502)	.124 (2.44)	.173	.0047	5.95

the period covered by the regression. This choice was confirmed by a Hildreth-Lu search in the vicinity of the chosen ρ. In all the regressions to be reported the Durbin-Watson test statistic falls between 1.93 and 2.01, indicating low auto-correlation of the residuals. In essence, regression (2) leads to a test for the difference of the mean return from these two groups of days where there is dependence between adjacent observations.[4]

For both the equally weighted and value-weighted indices the results from the ordinary least squares regression are reported in Table 1 for the entire 1963-1981 period, and for four sub-periods. For both indexes for the 1963-1981 period the F-statistics for the regressions and the t-statistics for the coefficient on the dummy are all statistically significant at the .0001 level. The monthly pattern in stock returns, therefore, is statistically significant. Also, the t-statistics on the constant term are not significant, which implies that all of the market's gains occur on the average during the first half of trading months.

Performing a single regression on the 1963-1981 returns presupposes a constant mean and variance for the returns over this period. Such may not in fact hold. Accordingly, the regression was performed on four sub-periods, one of four years and three of five years in length. The constancy assumption is more likely to be met in these shorter periods. For each of the four sub-periods for both indexes the coefficient on the dummy is of the expected sign, showing that in no sub-period did the effect disappear, and in six of the eight regressions the dummy's t-statistic is significant at the .05 level. Moreover, the t-statistics on the constant terms are uniformly insignificant; in all sub-periods

positive returns were realized on average only in the first half of trading months.

2.3 Cumulative Returns Over Various Holding Periods

In this section, the cumulative returns from a variety of holding periods will be examined to determine if the statistically significant results from the regressions in section 2.2 is induced by having chosen a particular way of dividing months into two sub-sets of days.

Appendix 2 reports the following statistics for all possible holding periods from trading day -13 to trading day +13, where day -1 is the last trading day of a calendar month and day +1 is the first trading day of the following month, and so on:

-- The mean cumulated return for the indicated holding period: for each of the 228 months in the 1963-1981 period, the cumulative return for the chosen holding period for each month was calculated by compounding the daily returns in the period. The arithmetic mean of these 228 compounded returns is reported.

-- The benchmark return for the holding period: The arithmetic mean daily return of all days in the 1963-1981 period, r_m, was compounded by the number of days in the chosen interval; e.g., for holding period -4 to +6, $r_{benchmark} = (1 + r_m)^{10} - 1$ would be reported.

-- A t-statistic for the difference of these two numbers: Calculated as $(r_{realized} - r_{benchmark})/\sqrt{(\sigma^2_{realized}/228 - 1 \text{ observations})}$.

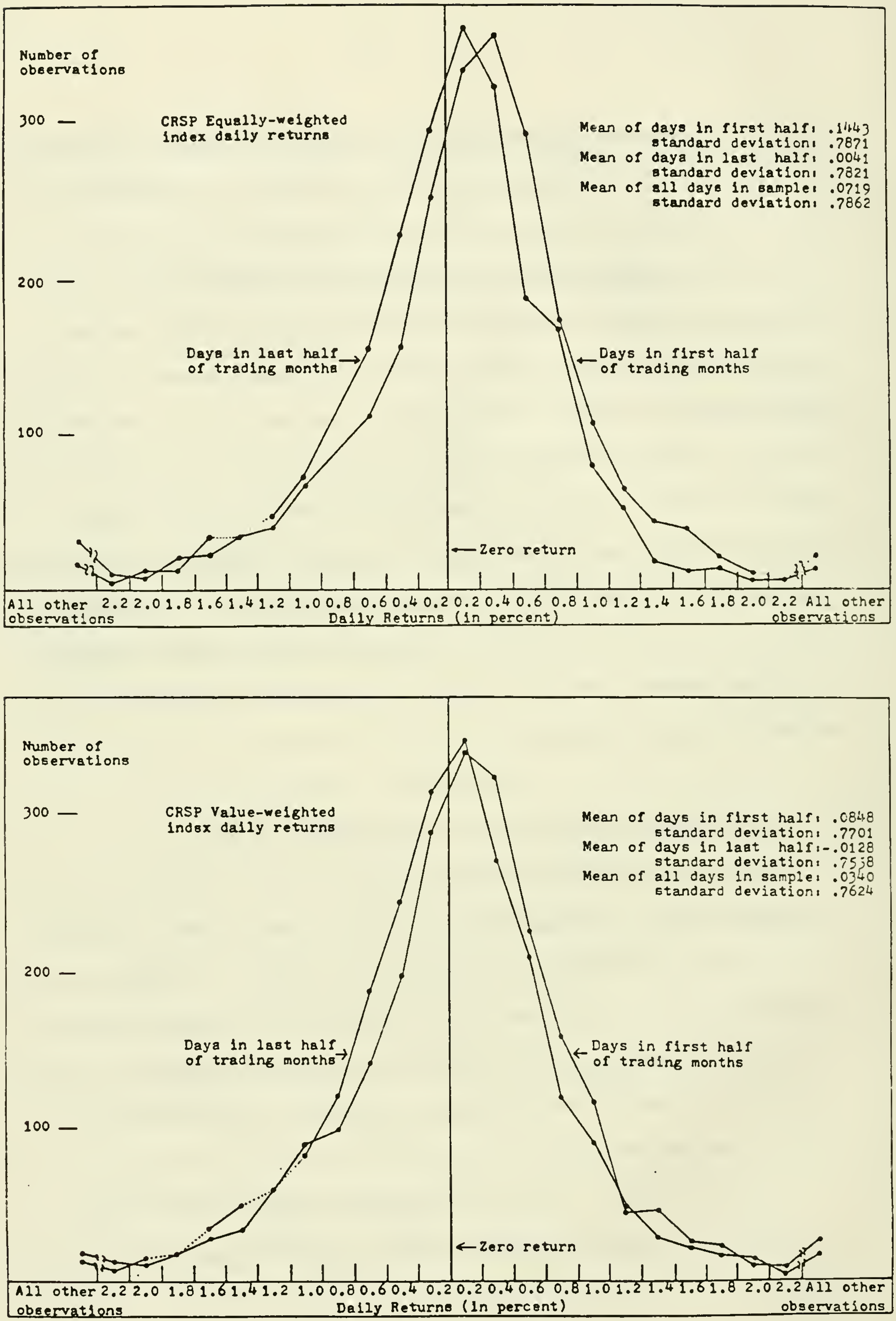
Uniformly, the best one, two, ... twelve-day holding period are those

which encompass trading days in the first half of the month. Uniformly, the worst one, two, ... twelve-day holding periods are those that exclusively encompass trading days in the last half of the month. The t-statistics associated with many holding periods exclusively in the first or last half of trading months are significant at the .05 level; those that are associated either with holding periods exclusively in the middle of months or with holding periods that span days in the first and last half tend to be insignificant. This pattern of returns and of t-statistics (i.e., the significant positive return periods clustered in the first half of trading months, and significant negative return periods clustered in the latter half) is what would be expected if the purported monthly pattern were not merely an artifact induced by the choice of a particular holding period or a particular way of dividing the month into two sub-samples of days.

2.4 Further Characterization of the Monthly Effect

To determine if the differing mean returns between days in the first and last halves of trading months are due to a small number of outliers, histograms for the frequency of returns are presented in Figure 2. Each interval is .2% wide, and each point represents the indicated number of days with returns falling in the interval. Identical numbers of trading days appear in each of the two populations, so the distributions are directly comparable.

The extreme tails of the two distributions appear similar. The differing means are due to a slight shift in the overall distributions of



Number of observations
300
200
100
CRSP Equally-weighted index daily returns
Mean of days in first half: .1443
standard deviation: .7871
Mean of days in last half: .0041
standard deviation: .7821
Mean of all days in sample: .0719
standard deviation: .7862
Days in last half of trading months
Days in first half of trading months
Zero return
All other observations 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 All other observations
Daily Returns (in percent)
Number of observations
300
200
100
CRSP Value-weighted index daily returns
Mean of days in first half: .0848
standard deviation: .7701
Mean of days in last half: -.0128
standard deviation: .7538
Mean of all days in sample: .0340
standard deviation: .7624
Days in last half of trading months
Days in first half of trading months
Zero return
All other observations 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 All other observations
Daily Returns (in percent)

Figure 2

the two populations. Hence the differing returns in the two halves of trading months are not due to a small number of outliers.

2.5 Cumulative Returns Over First and Last Half of Trading Months

The regressions reported in section 2.2 show a statistically significant difference between the mean daily stock returns from the first and last halves of trading months. However, no individual seeking to capitalize on this effect would hold stocks for only a single day; since the high-returning and low-returning days cluster in the first and last halves of trading months, cumulative returns over these half-months constitute an economically more relevant measure of the monthly effect. Accordingly, this section examines the cumulative returns over half-month periods.

2.5.1 Half-month mean returns. For each of the 228 trading months in the 1963-1981 period (where a "trading month," as earlier defined, extends from the last trading day of each calendar month (inclusive) to the last trading day of the following calendar month (exclusive)), define the cumulative return over the first nine trading days of each trading month as the product of one plus the daily stock index return over these nine days, minus one; define the cumulative return over the last nine days similarly, and let these cumulative returns proxy for the returns earned during the first and last half of trading months, respectively.

If the returns from all days of the trading month are drawn from a single distribution, then the following should be true:

Table 2

The mean cumulative return from the first nine trading days of each trading month in the sample, the mean cumulative return from the last nine trading days of each trading month in the smaple, and t-statistic for the difference of these two means.

Sample Period	Mean of First Nine-Day Returns (Standard Deviation)	Mean of Last Nine-Day Returns (Standard Deviation)	t-Statistic for Difference of the Means	Implied p[a]
		Equally-Weighted Index		
1963-1981 (228 months)	1.409% (3.71%)	-.021% (3.51%)	4.23	.00003
1963-1966 (48 months)	1.295% (2.45%)	-.0125% (2.25%)	2.70	.007
1967-1971 (60 months)	1.445% (3.36%)	-.002% (4.10%)	2.10	.034
1972-1976 (60 months)	1.256% (5.16%)	-.148% (3.94%)	1.66	.095
1977-1981 (60 months)	1.627% (3.07%)	.079% (3.23%)	2.70	.007
		Value-Weighted Index		
1963-1981 (228 months)	.826% (2.70%)	-.182% (2.65%)	4.01	.0007
1963-1966 (48 months)	.969% (1.71%)	-.290% (1.86%)	3.41	.0006
1967-1971 (60 months)	.866% (2.39%)	-.177% (2.95%)	2.11	.035
1972-1976 (60 months)	.546% (3.30%)	-.094% (3.07%)	1.09	.28
1977-1981 (60 months)	.950% (2.95%)	-.188% (2.39%)	2.30	.021

[a]The implied probability figure assumes a normal distribution for the nine-day cumulative holding period returns.

H: The mean return from the first half of trading months equals the mean return from the second half of trading months.

Tests of this hypothesis, both for the entire 1963-1981 period and for the four sub-periods examined in the regressions of section 2.2 are reported in Table 2.

For the entire 1963-1981 period, for both indexes, the t-statistic is statistically very significant, thereby showing that the mean return from the first half of trading months significantly exceeds the mean return from the second half of trading months, thus rejecting the null hypothesis of equal returns. In each of the four sub-periods for both indexes the point estimate of the mean return from the first half of trading months exceeds the point estimate of the mean return from the last half of trading months, and the t-statistic for the difference of the mean is significant at the .05 level in six of the eight comparisons.

The test statistics reported above, in common with the test statistics derived from the earlier regressions, presuppose constancy of the distribution of the returns on the market indexes over the test period. Even if the mean returns accuring to stocks are not constant over the nineteen-year test period, it is possible that the mean difference between returns earned in the first half of the month and those earned in the second half of the month (i.e., the "first half premium") is constant over time.

To examine this premium, define the first half of trading month premium for each of the 228 months in the sample as the difference of the cumulative returns from the first and the last nine trading days of that month. If the returns for all days of the month are drawn from a single

Table 3

The mean of the difference between the first nine-day and last nine-day cumulative holding period returns for each trading month, and a t-statistic for the difference of this mean from zero for both CRSP indexes.

1963-1981 Period	Equally-Weighted Index	Value-Weighted Index
Mean of first half of trading month premia (%)	1.433%	1.008%
Standard deviation	4.518%	3.755%
t-statistic	4.78	4.04
implied p	.00001	.00005

distribution, then the following hypothesis should hold:

H: The premium accruing to the first half of trading months is zero.

For each trading month, the difference between the cumulative returns from the first and last nine trading days was calculated; the mean and standard deviation of these differences for both indexes were calculated for the 1963-1981 periods, as well as for the four subperiods examined earlier. Pairwise comparisons of the means of the monthly premia accruing in all sub-periods resulted in an inability to reject the hypothesis of a constant beginning of trading month premium for each index during the entire 1963-1981 period, and accordingly only the full period pooled results are reported below in Table 3. The t-statistic, calculated on the assumption of a normal distribution for the beginning of trading month premium, is statistically very significant. Therefore, the beginning of the trading month premium differs significantly from zero and hence the null hypothesis is rejected for most confidence levels.

2.5.2 <u>First half-month return versus last half-month return</u>. The soundness of the test statistics reported above presupposes a normal distribution of some stock return, either of the daily stock returns in the regression of section 2.2, or of the half-month returns or the first half of trading month premium in section 2.5.2. In contrast, the χ^2 test in this section makes no such distributional assumptions.

Divide each trading month so that equal numbers of trading days appear in each half; if an odd number of trading days appears in any month discard the odd day in the middle of the month. Define the

Table 4

Tabulation of the number of times the first half of a trading month had a higher return than the last half of that same trading month, for the full period and four sub-periods.

Period	Frequency of Higher First Half Returns	Expected Outcome[a]	Realized Minus Expected	χ^2_{2-1}	Implied p
		Equally-Weighted Index			
1963-1981 (228 months)	155	114	41	29.48	<.00001
1963-1966 (48 months)	36	24	12	12.00	.0005
1967-1971 (60 months)	38	30	8	4.27	.04
1972-1976 (60 months)	38	30	8	4.27	.04
1977-1981 (60 months)	43	30	13	11.27	.0008
		Value-Weighted Index			
1963-1981 (228 months)	150	114	36	22.74	<.00001
1963-1966 (48 months)	38	24	14	16.33	.00006
1967-1971 (60 months)	38	30	8	4.27	.04
1972-1976 (60 months)	37	30	7	3.26	.07
1977-1981 (60 months)	37	30	7	3.26	.07

[a]Equal to half the number of months in the period. This expectation assumes independence of returns between the two halves of months.

[b]χ^2 with 2-1 degrees of freedom is calculated as $2(\text{observed} - \text{expected})^2/\text{expected}$.

cumulative return over each half-month as the product of one plus the daily returns over that period.

If the returns for all days of the trading month are drawn from a single distribution then the following should be true:

H: The probability is 1/2 that the cumulative return from the first half of a trading month will exceed the cumulative return from the second half of that same trading month.

This hypothesis can readily be subjected to a χ^2 test. For example, if the hypothesis is true, then the 228 months of data should yield an expected 114 months with superior first half returns. The observed frequency of superior first half returns for the equally-weighted index is 155. The χ^2 test statistic with 2-1 degrees of freedom is just $2(155 - 114)^2/114 = 29.49$, and analogously for the sub-periods.[6]

The observed results, both for the full nineteen years of data, and for the four sub-periods previously examined, are reported in Table 4. For both indexes, for the full 228 months of data, the null hypothesis is rejected for all confidence levels. Moreover, in each of the four sub-periods for both indexes the monthly effect is present and in the expected direction; in six of the eight comparisons the test is significant at the .05 level.

To summarize the conclusions of this section: Three hypotheses were tested, each of which is entailed by the assumption that all days of the trading month are drawn from a single distribution. The rejection of the three hypotheses thus requires rejection of the assumption of a single distribution for all days of the month.

2.6 Trading Strategy Based on the Monthly Effect

A trading strategy which capitalizes on the monthly effect is to hold stocks during the first half of trading months, and to invest risklessly (or to go short) during the second half. To help evaluate such strategies, the nineteen-year cumulative returns from investing in stocks only during the first or last halves of trading months are tabulated below (assuming no transaction costs); in any trading month with an odd number of trading days the odd day in the middle of the month is included in the last half, and hence about 5% more trading days are included in the last half cumulative return:

Nineteen-year Cumulative Return	Equally-Weighted Index	Value-Weighted Index
First-half cumulative return	2552.40%	565.40%
Last-half cumulative return	-0.25%	-33.80%
Nineteen-year buy-and-hold return	2545.90%	339.90%

Despite the greater number of trading days included in the last halves of months, the cumulative return from the first halves is clearly larger than the cumulative return from the last halves of months. Moreover, if one could costlessly transact, then the returns from holding stocks only in the first halves of trading months would have outperformed a buy-and-hold strategy over this nineteen-year period.

3. Discussion

3.1 Interpreting the Tests

The common consensus of the several (albeit non-independent) tests is that stock indexes have higher returns during the first half of trading months than during the last half. The tests use the same data and thus appear redundant; however, each test makes different assumptions about the underlying return generating process, and thus they complement one another.

The regressions reported in section 2.2 presuppose a stationary mean and variance for the daily stock index returns over the test period. While such an assumption may be approximately true for the four- and five-year regression sub-periods, it is unlikely to hold for the full nineteen years of available data, and hence the very significant test statistics arising from the full period regression may be suspect.

Section 2.5.1 compares the means of the cumulative returns over the first and last halves of trading months. These half-month returns provide a measure of the importance of the monthly effect that is economically more relevant than daily returns, since the difference between the first and last half-month returns measures the potential gains from exploiting the monthly effects. The difference between the half-month mean returns is statistically very significant. However, the test statistics presuppose both stationarity and normal distribution of the half-month returns over the period covered by the test.

Section 2.5.1 also reports an examination of the first half of month premium; this test presumes no stationarity of market returns, but rather a normally distributed first half of month premium with a constant

(possibly zero) mean. Test statistics based on these assumptions show the first half of month premium to be statistically very significant.

The χ^2 test reported in section 2.5.2 simply tallies the number of times stocks showed higher returns in the first half of trading months than in the last half of trading months; this test asks merely for the sign and not the magnitude of the relative performance of the two halves. However, the test makes no stationarity assumptions (at least none for longer than one month), and the highly significant test statistic resulting from this comparison is thus free of potential biases induced by unmet stationarity or distributional assumptions.

3.2 Caveats in Interpreting the Tests

3.2.1 One pass at history. Only one sequence of realized returns is available for examination, and it is always possible that, in this particular sequence, it "just happened" that the first half of trading months had higher returns than the last half. However, the available data put restrictions on the sort of happenstance which might have been responsible for this difference. In particular, the histogram of daily return frequencies presented in section 2.3 shows that a few outliers which happened to fall in the appropriate half of the month are not the source of the difference; rather, a slight shift in the overall distributions of the two populations is responsible for the differing means.

3.2.2 Pre-test bias. Whenever prior information on realized outcomes is employed in formulating a hypothesis which is then tested

against the same data, the resulting test statistics will be biased. This is the problem of "data mining."

In the present study comparing the first and last half of trading months rather than the halves of calendar months (i.e., including in the first half of trading months the high returning last trading day of calendar months) may appear to be an example of such a bias; all the tests reported above may thus be questioned.

One way of overcoming pre-test bias employs a hold-out sample of data; one "mines" some of the data and then tests resulting conclusions on the remainder.

There is an implicit hold-out sample in the present study. As noted in the Introduction, a number of stock market technicians advise that planned purchases be accelerated and that sales be deferred to capture the high returns around the beginnings of months, and uniformly they regard the period of high return as starting on the last trading day of calendar months. For example, the editor of the widely-read market letter "Market Logic" notes in his 1976 book that "Stocks have a marked tendency to rise during the first four days of every month and on the last day of every month. Put together this continuous span of five trading days constitutes the "Month-End" (strength) component." (Fosback, 1976) Presumably the technicians uncovered the month-end strength by mining the data, but, at least in the case just cited, the mining was completed by 1976, and hence the five years of data since then may be regarded as a hold-out sample. These five years correspond to the last of the four sub-periods examined in the tests reported in section 2. The statistically significant results yielded by e.g., the regression of

section 2.2 on the data from this sub-period alone show that pre-test bias cannot be the foundation of the monthly effect.

3.3 Examination and Rejection of Possible Causes of the Monthly Effect

3.3.1 Biased data? All tests were performed on the CRSP daily index returns. CRSP computes the returns for days around the start of calendar months in the same manner as they do for all other days. In particular, the stock weights in the value-weighted index are recalculated daily, and new issues are included in both indexes on the first day that they officially trade. Monthly bias in the index data does not appear to be responsible for the monthly effect.

3.3.2 Mismatch between calendar and trading time? The observed monthly effect is not being induced by a mismatch between calendar time and trading time. In the above tests months have been divided so that equal numbers of trading days fall into each half. If equal numbers of trading days encompass a greater number of calendar days in the beginnings of months than they do in the ends, higher mean returns from market close to market close might be expected in the first half of months. Such a mismatch could be caused only by the preferential accumulation of weekend or holiday closings in the first half of months. However, since no constant phase relationship exists between weeks and months, different days of the week, including weekends, will be distributed evenly across the halves of months. Three of the eight usual holiday closings always occur in the first half of months (i.e., New Year, Fourth of July, Labor Day) and four always occur in the last half

of months (i.e., Presidents Day, Memorial Day, Thanksgiving, Christmas). Two holidays, Good Friday and Election Day, either do not occur consistently in the same half of the month, or are not observed every year. In sum, neither holidays nor weekends preferentially fall in the first half of months.[7]

3.3.3 A dividend effect? The monthly effect is not being induced by the concentration of dividend payments in the first or last halves of months.

All tests were performed on the CRSP total return (or "dividend reinvestment") indexes, so preferential dividend payments in the first or last halves of trading months will not bias the temporal pattern of total return, at least to a first approximation. However, the different taxation of dividends and capital gains may lead earnings retained in the corporation to be valued differently than earnings paid out as dividends. Hence stocks may fall on the ex-dividend date by more or less than the dividend payment, and thus preferential dividend payments in the first or last half of trading months, even if reinvested, might lead to superior first half of month performance due to this ex-dividend tax effect.

Three cogent reasons can be given to show that the monthly effect is not being induced by this ex-dividend tax effect:

First, it is difficult to show that stocks fall on the ex-dividend date by an amount other than the dividend payment; indeed, the empirical evidence on this point is ambiguous. It would be surprising if this effect appeared so unambiguously in the present study when it was not being sought.

Second, a direct examination of the pattern of dividend payments accruing to the S&P 500 index during the first and last nine trading days of trading months for the first quarter of 1982 yields the following pattern (adapted from Gastineau and Madansky, 1983, table 1):

	Percent of Total First Quarter Dividends		
	Jan.	Feb.	Mar.
First nine days of trading month:	5.2%	43.0%	17.7%
Last nine days of trading month:	5.8%	12.5%	15.8%

Since there is substantial overlap in the composition of the S&P 500 index and the CRSP value-weighted index, a very similar pattern of dividend payments would presumably be found in the latter; a similar pattern would also be found in the other quarters of the year. Note that preferential dividend payments occurred only in the first half of the second trading month of the quarter. If the first half of trading month premium test of section 2.5.1 is repeated on the value-weighted index after excluding the second month of each quarter (and excluding Januarys as well, for reasons shortly to be treated) during the 1963-1981 period the resulting premium of 1.05% yields a very significant t-statistic of 3.25 for the 133 monthly observations. Assuming that the above pattern of dividend payments is representative of payments over the test period, these figures show temporal pattern in dividend payments did not induce the observed monthly effect.

Third, and most convincingly, a simple order-of-magnitude argument can show that the monthly effect is not being induced by an ex-dividend tax effect. Suppose for the sake of discussion that the dividend yield on the value-weighted index has averaged 6% per year, or 0.5% per month.

The observed first half of trading month premium for the value-weighted index has been 1.008% per month (Table 3) or <u>twice</u> the monthly dividend payments. Hence, even if all dividend payments were concentrated in the same half of months, the ex-dividend tax effect would have to be twice as large as the dividend payment itself (i.e., stock prices on average would either have to fall on the ex-dividend date by three times the dividend payment or else increase by the amount of the dividend) in order to induce the observed monthly effect. This sort of change in stock prices on ex-dividend dates is not observed.

3.3.4 <u>A manifestation of the January effect</u>? The monthly effect is not merely another manifestation of the "January effect." Keim (1983) and Roll (1983) have noted a tendency for small firms to experience significant excess returns in January, with much of the effect concentrated in the first few days of the month. To see if the tests for the monthly effect are capturing nothing more than the unusual strength in the beginning of January, the mean nine-day cumulative returns from the beginnings and ends of all trading months except January are reported in Table 5.

The effect of excluding Januarys on the nine-day means are appreciable and in the direction predicted by the January effect; for both indexes the means of both the first and the last nine-day cumulative returns are lower when Januarys are excluded, and the reduction is more pronounced for the equally-weighted index as would be expected if the January effect primarily influences small capitalization stocks. However, even when Januarys are excluded the monthly effect is still present in the remaining months as is evidenced by the differing first

Table 5

Top panel: Results from Table 2 for mean cumulative returns from the first, and last nine trading days of all 228 trading months in the sample.
Bottom panel: Comperable mean returns from the 209 months in the sample excluding January.

	Equally-Weighted Index	Value-Weighted Index
Mean nine day cumulative returns, all trading months (in %):		
First half of month	1.409%	.826%
Last half of month	-.021%	-.182%
t-statistic for difference of		
The means	4.23	4.01
Implied p	.00003	.00007
Mean nine day cumulative returns, all trading months (in %):		
First half of month	.998%	.765%
Last half of month	-.189%	-.242%
t-statistic for difference of		
The means	3.68	3.92
Implied p	.0003	.0001

and second half means, and the difference is still statistically significant. Hence the observed difference in the mean returns from the first and last halves of months is caused by something more than the unusually high returns at the beginning of January.

This conclusion can be reemphasized by repeating the χ^2 test of section 2.5.2 on the 209 months in the sample excluding Januarys. The first half of the trading month outperformed the last half of the same trading month 138 and 137 times for the equally- and value-weighted indexes respectively, compared with an expectation of 104.5. The resulting very significant χ^2 statistics of 21.48 and 20.22, and corresponding implied p of $< .0001$, show that the January effect is not solely responsible for the observed first half of trading month superior performance.

Neither is the observed monthly effect being induced by high returns during the first half of one or a few of the other months. In particular, the high returning months of July, November, and December (Rozeff and Kinney, 1976) are not solely responsible for the observed monthly effect. For each of the twelve trading months of the year table 6 tabulates the mean of the cumulative returns from the first and last nine trading days of the trading month, and also reports a t-statistic for the difference of the first half of trading month premium from zero.[8]

For only one of the months, February, does the point estimate of the last half of the trading month mean exceed the point estimate from the first half, and the corresponding t-statistic on the premium shows it to be insignificant. For all the remaining months the difference of the

Table 6

Tabulation of the mean cumulative returns from the first and from the last nine trading days of each trading month of the year, for both CRSP indexes, for the years 1963-1981; and t-statistic for significance of first half of trading month premium.

Trading Month		Equally-Weighted Index Mean Return[a]	Equally-Weighted Index t-statistic[b]	Value-Weighted Index Mean Return[a]	Value-Weighted Index t-statistic[b]
January	Beg.	5.97%	3.77	1.49%	1.46
	End	1.83%		0.48%	
February	Beg.	0.23%	-0.61	0.07%	-0.77
	End	0.92%		0.87%	
March	Beg.	1.12%	0.76	1.26%	0.90
	End	0.53%		0.62%	
April	Beg.	0.94%	1.68	1.02%	1.34
	End	-1.29%		-0.31%	
May	Beg.	1.19%	0.62	0.63%	0.70
	End	0.53%		0.02%	
June	Beg.	0.85%	1.08	0.88%	1.46
	End	-0.47%		-0.71%	
July	Beg.	1.28%	1.96	0.61%	2.24
	End	-0.89%		-1.07%	
August	Beg.	1.23%	2.68	1.07%	2.49
	End	-1.26%		-1.00%	
September	Beg.	0.26%	0.58	0.30%	0.79
	End	-0.30%		-0.43%	
October	Beg.	1.40%	2.02	1.17%	1.83
	End	0.00%		-0.12%	
November	Beg.	1.51%	1.73	1.05%	1.66
	End	0.14%		-0.09%	
December	Beg.	0.95%	0.91	0.35%	0.80
	End	0.02%		-0.45%	

[a]Each reported return represents the mean of the nineteen observations of the cumulative returns from the first or last nine trading days of the indicated trading month.

[b]T-statistic for significance of the mean first half of trading month premium (defined for each month as first nine day minus last nine day cumulative return) based on the nineteen premia for each month.

means is in the direction expected by the monthly effect; for several of the months for both indexes the t-statistic on the premium is significant a the .10 level (two-tailed) based on that month's data alone. The overall monthly effect results from the combined influence of all these months and does not derive from unusually high returns during the beginnings of only a few months.

3.4 Small Firms and the Monthly Effect

The January period of unusually high small firm excess returns actually starts on the last trading day of December; indeed, the last trading day of December together with the first four trading days of January alone account for 38% of the annual return earned by the equally-weighted index in excess of the value-weighted index (Roll, 1983). The histograms of mean daily returns presented in section 2.1 shows that on average for all months both indexes earn unusually high returns on the last trading day and first four trading days of calendar months. These are the five days which at the end of December and beginning of January show unusually high small firm excess returns.

This five day overlap of high monthly returns and the January small firm excess return suggests that the incremental return earned by small over large firms should be examined for a monthly component. The first and last half of trading month mean cumulative returns for the incremental returns earned by small over large firms (which was proxied by the return earned by the equally-weighted index in excess of the value-weighted index) excluding Januarys were calculated in the manner described in section 2.5.1. The means and standard deviations of these

Table 7

Incremental return earned by small over large firms during the first and last nine days of trading months (excluding January) during 1963-1981, and during two sub-intervals.

	Full Period 1963-1981 (209 months)[a]	Small Firms Outperform Large Firms[b] 1963-1968, 1974-1981 (154 months)[a]	Small Firms Outperform Large Firms[b] 1969-1973 (55 months)[a]
First nine-day cumulative mean return:[c]	.219%	.349%	-.144%
(standard deviation):	(1.404%)	(1.380%)	(1.406%)
t-statistic:	2.26	3.13	-0.75
Last nine-day cumulative mean return:[c]	.036%	.312%	-.736%
(standard deviation):	(1.673%)	(1.595%)	(1.643%)
t-statistic:	0.31	2.42	-3.29
First half premia[d]	.183%	.037%	.592%
(standard deviation):	(1.741%)	(1.759%)	(1.619%)
t-statistic:	1.52	0.26	2.69

[a]The trading month of January is excluded from the sample to eliminate the very powerful "January Effect" on small firm returns.

[b]The months in the two subintervals were previously identified by Brown, Kleidon and Marsh (1983) as those during which small firms had higher (lower) risk adjusted average returns than large firms.

[c]For each day the incremental return earned by small over large firms is proxied by the difference between the return earned by the equally-weighted index over the value-weighted index on that day.

[d]The first half premium for each month is defined as the difference between the first and last nine day cumulative return for that month.

cumulative returns are reported in table 7; also reported are the first half of trading month premium, the standard deviation of this premium, and a t-statistic for the difference of the premium from zero.

During the full 1963-1981 period small firm returns exceeded large firm return during both the first half and last half of trading months, but no strongly significant monthly pattern to the small firm superior return exists as evidenced by the statistically insignificant $t = 1.52$ for the first half of trading month premium..

Examining only the full 1963-1981 period obscures a potentially important distinction: The incremental return of small over large firms has varied over time; indeed; during the 1969-1973 period small firms had lower risk-adjusted average returns than big firms (Brown, Kleidon and Marsh, 1983). Accordingly, the years 1963 through 1981 were split into two groups, the 1969-1973 period, and all the remaining years; table 7 reports the same statistics for these two groups of years as it does for the full pooled period. During the years when small firms earned more than large firms their premium accrued uniformly at the rate of roughly 0.3% during both the first and last halves of trading months; the premium over large firms earned during both the first and last halves are significantly different from zero, but insignificantly different from each other.

In contrast, during the years when small firms earned less than large firms, the underperformance in the first halves of trading months was small and statistically insignificant, but the underperformance in the last halves of trading months was large and very significant; the first half of trading month premium was also significant. Moreover, during

these 55 months the first half of trading months outperformed the last half 36 times, to which the χ^2 test of section 2.5.2 attaches a χ^2_{2-1}-statistic of 5.24, thereby showing that the observed underperformance of the last half of months was not attributable to a small number of outlying months. During this period of inferior small firm performance their discount accrued primarily during the last halves of trading months.

In sum, any possible interaction between small firm excess returns and the monthly effect, if indeed any exists, is complex. Excluding January, there is little evidence of a monthly component in the incremental return of small over large firms during either the full pooled period or during those periods when small firms earned a premium over large firms. However, during those years when small firms were at a discount, there was a significant monthly component, with small firms underperforming primarily during the last halves of trading months.

3.5 Conclusion

The purpose of this paper is to point out the existence of what has been called a "monthly effect" in stock returns.

The magnitude of this seeming anomaly is by no means small. During the nineteen years studied all of the market's cumulative advance occurred during the first half of trading months, with the last half of trading months contributing nothing.

Moreover, the variation between high and low return days of the month induced by the monthly effect is of roughly the same order of magnitude

as the variation between high and low return days of the week reflected in the well-known weekend effect.

The mean returns for Monday, the lowest of the week, and for Friday, the highest for the two CRSP indexes are (Gibbons and Hess, 1981):

Equally-Weighted Index			Value-Weighted Index		
Monday:	-.107%		Monday:	-.117%	
Friday:	+.216%		Friday:	+.106%	
	.323%	Difference		.223%	Difference

The mean daily return during the first and last halves of trading months, reported in section 2.2 are:

Equally-Weighted Index			Value-Weighted Index		
Monday:	+.150%		Monday:	+.103%	
Friday:	-.001%		Friday:	-.015%	
	.149%	Difference		.223%	Difference

which differences are about 50% as large as the differences induced by the weekend effect. However, until the varying weekday returns in which successive high return Fridays are separated by low or negative return days, the high return days of the month are clustered. In essence, the first nine days of trading months have returns comparable to seven to nine Fridays in succession.

No explanation for the Monthly Effect has been advanced here. However, the existence of this pattern in the data may need to be considered in other empirical studies, in particular in event studies of corporate or economic announcements which occur disproportionately in the first or last half of the month.

FOOTNOTES

1 Note, by the way, that since the average month consists of slightly more than four weeks, no constant phase relationship can exist between weeks and months. Hence, any monthly pattern must exist in its own right, and not depend on the weekend effect.

2 These stock market advisors are primarily "technicians." Their number includes such notables as Martin Zweig, Arthur Merrill, Yale Hirsch, and Norman Fosback.

3 The convention followed in this and all subsequent tests defines the first <u>ten</u> trading days of each trading month as the proxy for the "first half" in any test in which the first half is compared wth all remaining days of the month. By convention the first <u>nine</u> trading days will proxy for the "first half" and the last <u>nine</u> trading days for the "last half" in those tests which require a fixed and equal number of days in the first and last halves. Nine rather than ten trading days are employed in these latter tests to avoid overlap of the intervals in those months with fewer than twenty trading days. Also, by convention in this and in all the following tests, the 1963-1981 time period extends from the last trading day of 1962 (inclusive) through the last trading day of 1981 (exclusive), and likewise for all the sub-periods examined.

4 In a regression with a very low R^2 virtually the entire daily index return, less the mean, will be captured by the residual, and hence ordinary least squares estimation of the model presupposes a normal distribution for the daily index returns. The hypothesis of return normality (or lognormality for longer periods) while commonly employed, is not without its challengers. Fama (1965) claimed that individual security returns are too leptokurtotic to be normally distributed; he concluded that the evidence favors Mandlebrot's infinite variance stable Paretian hypothesis. Rosenfeld (1980) concluded that the data support a model of returns generated by a diffusion process with a slowly changing variance, that is, a superposition of normal distributions. Zellner (1976) has shown that this results in a Student's t-distribution, and that the use of OLS in models with this distribution of residuals leads to estimators which are maximum likelihood, and also minimum variance linear unbiased estimators when the variance exists. Moreover, the standard t and F tests will still apply provided the estimate of the variance is modified as the distribution departs increasingly from normality. Since the daily index returns are very close to normally distributed the test results predicted on normality and reported here are not unreliable due to this cause.

5 Earlier the assumption was made that daily index returns may be treated as being normally distributed. The sum of normally distributed variables is itself normal, but the product is not, and hence strictly speaking the cumulative product over nine daily returns cannot be normally distributed, as the test statistics here implicitly assume. As a check on the possibility that this assumption may be biasing the reported results all tests employing multi-day cumulative returns were repeated using continuously compounded returns, with virtually identical results.

6 The null hypothesis presupposes independence of the two half-month returns. The autocorrelation of the daily index returns induce a correlation between half-month returns on the order of 0.2, and hence may bias the reported tests.

7 Holidays may influence the monthly pattern of returns in yet another way. Ariel (1984) has noted a tendency for stocks to show very high returns on the trading day prior to all market holiday closings. To see if these high pre-holiday returns are inducing the monthly pattern, the first half of trading month premium test described in section 2.5.1 and table 3 was repeated after first setting the returns for trading days prior to holidays equal to the global mean of all days. Resulting t-statistics of 4.59 and 3.71 for the equally- and value-weighted indexes show that pre-holiday high returns are not inducing the monthly effect.

8 The significance of the first half premium (rather than of the difference of the half month means) is reported since section 2.5.1 suggests that the premium may be constant over the 19 years of data.

Appendix 2

CRSP Equally-Weighted Index
Mean of cumulative holding
period starting on the day
on the diagonal and ending
on the day across the top
of the page.

Starting day of holding period

	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
-13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-12		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-11			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-10				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-9					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-8						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-7							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-6								[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-5									[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4										[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-3											[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2												[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-1													[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1														[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2															[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3																[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4																	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5																		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6																			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7																				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8																					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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10																							[illegible]	[illegible]	[illegible]	[illegible]
11																								[illegible]	[illegible]	[illegible]
12																									[illegible]	[illegible]
13																										[illegible]

Appendix 2

CRSP Value-Weighted Index
Mean of cumulative holding period starting on the day on the diagonal and ending on the day across the top of the page.

Starting day of holding period

	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
-13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-12		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-11			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-10				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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-8						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-7							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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2															[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3																[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4																	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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